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TO:
Mr. George LearFROM:
Niagara Mohawk Power Corp.
Syracuse, New York
Mr. Rudolph R. SchneiderDATE OF DOCUMENT
8/3/76DATE RECEIVED
8/6/76☒ LETTER
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PROP

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DESCRIPTION

Ltr. w/attached...re their 5/19/76 ltr. and
our 6/9/76 ltr....furnishing additional in
information concerning Assembly Averaged
Power-Void Relationship Tech Spec.

PLANT NAME:

(5-P)

Nine Mile Point #1

ENCLOSURE

ACKNOWLEDGED

DO NOT REMOVE

SAFETY

FOR ACTION/INFORMATION

ENVIRO 8/6/76

R.J.L.

ASSIGNED AD:

☒ BRANCH CHIEF:

Lear

PROJECT MANAGER:

☒ LIC. ASST.:

Parrish

ASSIGNED AD:

BRANCH CHIEF:

PROJECT MANAGER:

LIC. ASST.:

INTERNAL DISTRIBUTION

☒ REG FILE☒ NRC PDR☒ I & E (2)☒ OELD☒ GOSSICK & STAFF

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SYSTEMS SAFETY

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SCHROEDER

ENGINEERING

MACCARRY

KNIGHT

SIHWEIL

PAWLICKI

PLANT SYSTEMS

TEDESCO

BENAROYA

LAINAS

IPPOLITO

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OPERATING REACTORS

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SITE SAFETY &

ENVIRO ANALYSIS

DENTON & MULLER

ENVIRO TECH.

ERNST

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SITE TECH.

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J. COLLINS

KREGER

PROJECT MANAGEMENT

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P. COLLINS

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REACTOR SAFETY

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NOVAK

ROSZTOCZY

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AT & I

SALTZMAN

RUTBERG

OPERATING TECH.

☒ EISENHUT☒ SHAO☒ BAER☒ BUTLER☒ GRIMES

EXTERNAL DISTRIBUTION

CONTROL NUMBER

☒ LPDR: Oswego, N.Y.☒ TIC:☒ NSIC:☒ ASLB:☒ ACRS/6CYS HOLDING/SEN

NAT LAB:

REG. VIE

LA PDR

CONSULTANTS

PARRISH

BROOKHAVEN NAT LAB.

ULRIKSON(ORNL)

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1990

the 1990s, the number of people in the world who are under 15 years of age is expected to increase from 1.1 billion to 1.5 billion. The number of people aged 65 and over is expected to increase from 200 million to 400 million. The number of people aged 15 and over is expected to increase from 3.5 billion to 4.5 billion. The number of people aged 15 and over is expected to increase from 3.5 billion to 4.5 billion. The number of people aged 15 and over is expected to increase from 3.5 billion to 4.5 billion.

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NIAGARA MOHAWK POWER CORPORATION

NIAGARA  MOHAWK

300 ERIE BOULEVARD WEST
SYRACUSE, N. Y. 13202

August 3, 1976



Director of Nuclear Reactor Regulation
Attn: Mr. George Lear, Chief
Operating Reactors Branch #3
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

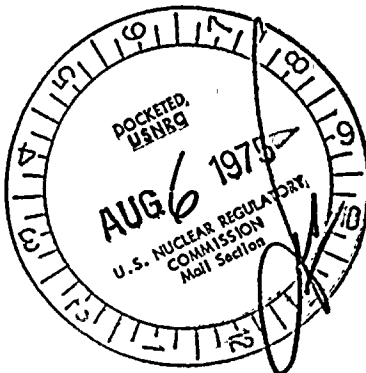
Re: Nine Mile Point Unit 1
Docket No. 50-220
DPR-63

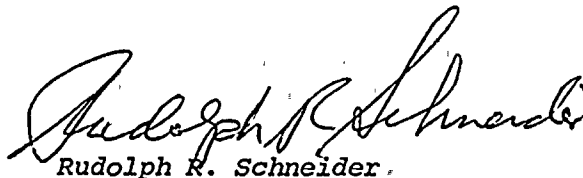
Dear Mr. Lear:

Our letter of May 19, 1976 transmitted proposed changes to the Assembly Averaged Power-Void Relationship Technical Specification for Nine Mile Point Unit 1. Your letter of June 9, 1976 requested additional information regarding that proposed change. The attached responses address the questions contained in your letter.

Sincerely,

NIAGARA MOHAWK POWER CORPORATION




Rudolph R. Schneider,

Vice President - Electric Operations

Attachment

Regulatory Docket File

7918

THE UNITED STATES OF AMERICA

DEPARTMENT OF THE INTERIOR

BUREAU OF LAND MANAGEMENT

WASHINGTON, D. C.

OFFICE OF THE ASSISTANT SECRETARY

WASHINGTON, D. C.

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RESPONSES TO JUNE 9, 1976 NRC QUESTION
NINE MILE POINT UNIT 1
Docket No. 50-220
DPR-63

Request

Provide a quantitative explanation of how exposure dependent "B" values are calculated. Include examples which show how different values of "B" were calculated for two different exposures of the same fuel. The examples should show (1) the relationships (equations) assumed, and (2) the source and numerical values of all terms in the relationship for:

1. Maximum Average Planar Linear Heat Generation Rate (MAPLHGR) and Average Heat Generation Rate (\dot{q}) (i.e., assumed peaking factors).
2. Dryout Time. (i.e., h_g , h_{in} , flow, average density, \dot{q}).
3. "B" values (i.e., void fraction, peaking factor, power).

Response

The duration of nucleate boiling for non-jet pump plant ECCS analyses has been determined using the correlation (Equation 1, below) described in "General Electric Compliance with 10CFR50 Appendix K-Acceptance Criteria I.C.4." That correlation shows the time to boiling transition (dryout time) is a function exclusively of liquid volume fraction and power input to the bundle. Converged MAPLHGR limits and conservative axial power distributions were assumed for the dryout time determinations. Both MAPLHGR limits and dryout times are exposure dependent. The following development shows how "B" values are calculated.

$$\Delta t = \frac{(0.31) (\rho_f) (h_{fg})}{Q'''}$$

Equation 1

Δt = time to transition boiling, hr.

ρ_f = saturated liquid density, lbm/ft³

h_{fg} = enthalpy of vaporization, BTU/lbm

$$Q''' = \frac{\dot{q}}{V (1 - \alpha_i)}$$

\dot{q} = Power generation in bundle, BTU/hr = (PF) (FCP) (ABTU)

PF = bundle radial power factor

FCP = fractional core power relative to 1850 MW

ABTU = average bundle output at 1850 MW, BTU/hr

V = active coolant volume, ft³

α_i = void fraction

Therefore . . .

$$\Delta t = \frac{(0.31) (\rho_f) (h_{fg}) (V) (1 - \alpha_i)}{(ABTU) (PF) (FCP)} \quad \text{Equation 2}$$

$$\text{"B" Factor} \equiv \frac{(1 - \alpha_i)}{(PF) (FCP)} \quad \text{Equation 3}$$

Limiting this "B" factor relationship will assure that local power void values will not result in dryout times shorter than those used in the ECCS Analysis.

Using Equation 2:

$$\text{"B" Factor} = \frac{(ABTU) (\Delta t)}{(0.31) (\rho_f) (h_{fg}) (V)} \quad \text{Equation 4}$$

Assumed nominal values are:

$$ABTU = 1.1869 \times 10^7 \text{ BTU/hr}$$

$$\rho_f = 45.977 \text{ lbm/ft}^3$$

$$h_{fg} = 641.36 \text{ BTU/lbm}$$

$$V = 1.2696 \text{ ft}^3, \text{ Initial Core}$$

$$V = 1.2948 \text{ ft}^3, \text{ Reloads 1, 2, 3}$$

$$V = 1.2936 \text{ ft}^3, \text{ Reloads } 4, 5$$

Substituting the above values in Equation 4 yields the "B" factor relationships for the different reloads:

$$\text{"B" Factor} = (1022.688)(\Delta t) \quad \text{Initial Core} \quad \text{Equation 5}$$

$$\text{"B" Factor} = (1002.784)(\Delta t) \quad \text{Reloads 1, 2, 3} \quad \text{Equation 6}$$

$$\text{"B" Factor} = (1003.714)(\Delta t) \quad \text{Reloads 4, 5} \quad \text{Equation 7}$$

The following examples show how different values of "B" were calculated for two different exposures of the same fuel (Reload 3):

<u>Exposure</u>	<u>ECCS Analysis Dryout Times</u>	<u>MAPLHGR</u>
5000 MWD/T	1.48 sec	10.68
25000 MWD/T	1.59 sec	9.92

Substituting the above dryout times in Equation 6 yields:

For 5000 MWD/T:

$$\text{"B" Factor} = (1002.784)(\Delta t)$$

$$\text{"B" Factor} = \frac{(1002.784/\text{hr})(1.48 \text{ sec})}{3600 \text{ sec/hr}}$$

$$\text{"B" Factor} = 0.412$$

For 25000 MWD/T:

$$\text{"B" Factor} = (1002.784)(\Delta t)$$

$$\text{"B" Factor} = \frac{(1002.784/\text{hr})(1.59 \text{ sec})}{3600 \text{ sec/hr}}$$

$$\text{"B" Factor} = 0.443$$

Request

Demonstrate how "B" values are calculated to assure conservatism when using the dryout times assumed in the ECCS analysis.

Response

As indicated in the above response, nominal values were used to calculate the "B" factors. Converged MAPLHGR limits and conservative axial power distributions were assumed for the dryout time determinations. In addition, a conservative correlation (G.E. compliance with 10CFR50, Appendix K criteria I.C.4.) was used which was previously approved by the Commission.

A "B" Factor Limiting Condition for Operation is not necessary to assure that actual dryout times are conservative. Dryout time is only one of many conservative inputs used to determine MAPLHGR limits, the ultimate restriction of interest. Sensitivity analyses performed by our fuel supplier have determined that the parameters used to calculate dryout time (void fraction, axial power distributions) are conservative when compared to normal plant operation.

